The allocation of effort to university-industry interactive activities by faculty members: a theoretical and empirical approach

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We develop a model of individual choice in which faculty member is the rational agent and maximises a utility function. We find an interior optimum of interactive effort that depends on parameters of the utility function, wage, net revenue from a unit of knowledge produced by interactive activities, relative weight given to interactive vs. non-interactive activities in the determination of prestige and knowledge contribution by unit of time allocated to each activity. The model is tested by using a sample of 380 university professors from the Valencian Community, a Spanish region. We use censored and discrete choice econometric models to estimate an equation for the optimum effort allocated to interactive activities and another one for the real interaction. We conclude, first, that interaction activities could be explained by a maximising utility model and that individual responds to non-monetary rather than monetary incentives and to the difficulty of producing non-interactive rather than interactive knowledge. Second, we detect the possible existence of rationing, since optimum effort and real interaction depend on different variables. This is possibly an idiosyncrasy of our sample, coming from a region with low absorptive capacity. Policy initiatives may see the promotion (or disincentive) of university-industry interaction as a medium-long term target rather than a short-term one and may be aware of situations arising from rationing.

1. Introduction

The importance of increasing university-industry interaction (UII) in most developed Western economies motivates this research. UII takes place in the form of contract and collaborative research, industry-oriented student's curricula, practices for students in firms, consultancy, joint centres, scientist exchange, informal contacts, seminars for firms, patent licensing, etc. The reasons behind this growth of UII lie in the enhancement of technological innovation attributed to a more tangible orientation of academic activities.

Within innovation studies, several approaches have come to justify the interweaving of universities in the economy: Freeman (1987) and Lundvall (1988) under the perspective of national systems of innovation, Gibbons et al. (1994) with their detection of new Mode 2 of knowledge production, Etzkowitz and Leydesdorff (1996) with their ideas about the Triple Helix model, etc. These approaches differ in the importance granted to universities in the innovation process, but do not question that some degree of interaction with firms should exist.

Other voices have been more critical. The economics of science approach recovers the Mertonian ideas that the mechanism of review by peers can efficiently assign R&D resources (Dasgupta and David, 1994). It also emphasises that the promotion of UII responds to a narrow vision of the benefits of basic research, which leaves aside less tangible but equally beneficial links with innovation (David et al., 1994). Some of these benefits are increasing useful knowledge, training skilled graduates, creating new scientific instrumentation and methodology, forming networks and social interaction, increasing the capacity for scientific and technological problem-solving, creating new firms (Salter and Martin, 2001), providing social knowledge and access to unique facilities (Scott et al., 2002).

The former conflicting views set an ongoing debate on whether the marginal value of interactive activities is higher than the marginal value of non-interactive activities or vice versa. This debate is also present in policymakers and university managers' views. It is convenient to understand the rationale underlying the process of allocation of effort between different academic activities.

The ultimate decision regarding this rationale in the academic environment corresponds to the individual faculty member. At least in public universities, faculty members are autonomous to decide whether to engage on interactive activities or not. The aim of this paper is to analyse the effort they allocate between interactive and non-interactive activities. What are the motivations behind faculty members' behaviour? Do monetary incentives matter more than non-monetary ones? Is it important that production of interactive knowledge may be less time-consuming than of non-interactive one?

To reach this goal, this is the structure of the rest of the paper: Section 2 presents a theoretical model on how faculty members choose the optimal effort. It draws from previous models by Beath et al. (2003) and Jensen and Thursby (2004). A difference with our model is that we do not introduce faculty members' time devoted to research in the utility function but faculty members' research output. Furthermore, we do not assume the distinction between basic research leading to prestige and applied research as a source of income, but between non-interactive and interactive activities, both of them leading to prestige and the former also as a source of income.[1] In addition, we carry out an econometric estimation. Section 3 explains the sample we gathered to test the model. Section 4 shows the results. Section 5 concludes and provides guidelines for future research.

2. Theoretical model

In order to study the professor interactive activities, we develop a model of individual choice in which a maximising utility agent allocate his scarce time between interactive and non-interactive activities. We consider an activity interactive when it involves a relationship with industrial partners outside the university and non-interactive in the opposite case. This classification overlaps with the usual distinction among academic R&D, teaching and management activities since both interactive and non-interactive activities may include these tasks.

We assume that the representative university professor –considered rational from an economic point of view– maximises the utility function defined by equation (1). Professor's utility level depends on two arguments: income (Y) and subjective prestige (M) that comes out of academic activities.

$$U = M^{e}\, Y^{1-e} \tag{1}$$

Being e a parameter with $0 < e < 1$

On one hand, subjective prestige derives from the contribution to knowledge from the professor's activities. This contribution comes from two sources: interactive and non-interactive activities. We assume that M is obtained as a weighted average of each type of contribution.

$$M = \delta\ K_t + (1-\delta)\, K_n \tag{2}$$

Where

K_t – Professor contribution to knowledge from interactive activities.

K_n – Professor contribution to knowledge from non-interactive activities.

δ - Parameter; $0 \le \delta \le 1$

On the other hand, the individual income may be broken down in wage and revenue from the output of interactive activities, both given. Therefore

$$Y = w + Q\ K_t \tag{3}$$

Where

w – Professor wage

Q – Net revenue from a unit of knowledge coming from interactive activities.

Knowledge outputs, both interactive and non-interactive, are determined as linear functions of total time allocated in each activity.

$$K_t = A\ T \tag{4}$$

$$K_n = B\ N \tag{5}$$

Where

T – Time allocated by the professor to interactive activities

N - Time allocated by the professor to non-interactive activities

A, B – parameters

For the sake of simplicity, we normalise professor total time available to interactive and non-interactive activities to one. Therefore, the time constraint for professor will reduce to

$$1 = T + N \tag{6}$$

Substituting equations 2 to 6 into equation 1, utility can be expressed as a function of the amount of time devoted to interactive activities (T), being T the only decision variable,

$$U = \left[(1-\delta)B(1-T) + \delta AT\right]^{e}\left(w + QAT\right)^{1-e} \qquad (7)$$

By maximising the latter expression with respect to T, we obtain the following first order condition that is the result of the professor's optimisation problem:

$$T = \frac{QA\ (1-\delta)\,B\,(1-e) - w\left[(1-\delta)B - \delta A\right]e}{QA\left[(1-\delta)B - \delta A\right]} \qquad (8)$$

Therefore, optimum time allocated to interactive activities only depends on the parameters of the model. Now, considering that T must lie between 0 and 1, we can define T* such that individual chooses

$$T^* = 0 \ if\ T < 0$$
$$T^* = T \ if\ 0 \le T \le 1$$
$$T^* = 1 \ if\ T > 1$$

The condition for an internal solution, i.e. for 0 < T < 1, is:

$$\frac{(1-e)QA(1-\delta)B}{QA + we} < (1-\delta)B - \delta A < \frac{(1-e)QA(1-\delta)B}{we} \qquad (9)$$

We can rewrite it this way:

$$\frac{(1-e)QA}{QA + we} < 1 - \frac{\delta A}{(1-\delta)B} < \frac{(1-e)QA}{we} \qquad (10)$$

One necessary condition for this former to be met is that

$$(1-\delta)B > \delta A \qquad (11)$$

In other words, the contribution to prestige of one unit of time devoted to non-interactive activities $(1-\delta)B$ must be higher than the correspondent contribution from one unit of time in interactive activities (δA). This is easy to understand: since interactive activities provide income, the individual would devote the totality of his time to these activities if the contribution to prestige of one unit of time devoted to these activities were equal or higher. Moreover, the difference between these two terms must be enough as to compensate the income received. This minimum difference depends on the income the individual can obtain from a unit of time devoted to interactive activities (QA) and the relative preference for income in the utility function $(1-e)$. On the other hand, the value of this difference has also a maximum. Were the difference too high, the individual would concentrate all his time in non-interactive activities.

To ensure that the solution in equation (8) corresponds to a maximum, we obtain the second order condition of this problem, which corresponds to the following equation

$$\frac{\partial^2 U}{\partial T^2} = -\left[\partial AT + (1-\delta)B(1-T)\right]^{e}\left(w + AQT\right)^{1-e} \bullet \left\{ \frac{e(1-e)\left[\partial A - (1-\delta)B\right]^2}{\left[\delta AT + (1-\delta)B(1-T)\right]^2} + \frac{e(1-e)(QA)^2}{(w+QAT)^2} + \frac{2e(1-e)QA\left[(1-\delta)B - \delta A\right]}{\left[\delta AT + (1-\delta)B(1-T)\right](w+QAT)} \right\} < 0 \qquad (12)$$

Considering that an interior solution holds and differentiating (8), we obtain a comparative statics exercise:

$$\frac{dT}{dw} = \frac{-e}{QA} < 0 \qquad (13)$$

$$\frac{dT}{dQ} = \frac{we}{Q^2 A} > 0 \qquad (14)$$

$$\frac{dT}{d\delta} = \frac{(1-e)\,B\,A}{\left[\delta A - (1-\delta)B\right]^2} > 0 \qquad (15)$$

$$\frac{dT}{dA} = \frac{(1-\delta)\,(1-e)\,Q^2 A^2 \delta + weQ\left[\delta A - (1-\delta)B\right]^2}{\left\{QA\left[\delta A - (1-\delta)B\right]\right\}^2} > 0 \qquad (16)$$

$$\frac{dT}{dB} = \frac{-(1-\delta)\,(1-e)\,\delta\,A}{\left[\delta A - (1-\delta)B\right]^2} < 0 \qquad (17)$$

$$\frac{dT}{de} = -\left[\frac{QA(1-\delta)B + w[(1-\delta)B - \delta A]}{QA\left[(1-\delta)B - \delta A\right]}\right] < 0 \qquad (18)$$

We conclude that the individual will decide to allocate more time to interactive activities the higher revenue from a unit of knowledge from interactive activities (Q) and the amount of interactive knowledge produced by a unit of time devoted to such activity (A). On the other hand, the individual will be more reluctant to allocate time in interactive activities the higher his wage (w), the amount of non-interactive knowledge produced by a unit of time devoted to such activity (B), the weight given to non-interactive activities in the determination of prestige (δ) and the relative preference for prestige versus income (e).

3. Econometric model

The purpose of this section is to estimate a series of econometric models that will allow us to test the theoretical model put forward in the previous section. We will use as explained variables some proxies for time allocated to interactive activities.

In order to estimate the models, we have data on faculty members from the Valencian Community, gathered through a survey carried out in 2001. The Valencian Community is a Spanish region, with a per capita GDP about the national average. Its manufacturing structure relies on traditional, low-tech sectors such as toys, textile, shoes, furniture, ceramic tiles, etc. This pattern of specialisation is one of the reasons why the region has several technological weaknesses as for example a low level of expenditure on R&D (0.81% of GDP in 2002, 79% of the Spanish average and 42% of EU-15 average) mainly on the part of firms (that financed 32% of total R&D in 2001, 65% of the Spanish average and 54% of EU-15 average), a shortage of financial organisations of innovation, and little articulation of institutional links (Fernandez et al., 2001). Therefore, it fits in the description of a region with low absorptive capacity, and we will have to take it into account in the interpretation of the results[2].

The population of the survey includes faculty members from the five public universities of the Valencian Community. We stratified it in three teaching scales: full professors, assistant professors and associate professors[3]. Selection was by means of simple random sampling. The sample was 10% of the population, or 872 individuals[4]. We obtained a response rate of 44%, so we could build a database with 382 observations.

Unfortunately, the questionnaire was not designed to match our theoretical model. Therefore, we do not have direct measures to test it empirically. However, we are able to build some proxies departing from the existing information.

To start with, the questionnaire included questions regarding the support for different objectives of UII, which we will use as a proxy for the optimum effort allocated to interactive activities. The basic assumption is that the higher support for the objectives of UII, the higher propensity to allocate time to interactive activities. Hence, we define:

- Support: average importance given to six objectives of UII
  - To favour oriented research in the university
  - To participate in the economic development of the region
  - To intensify the commercialisation of the results of academic research
  - To favour the creation of firms based on academic research
  - To obtain additional funds for R&D activities
  - To adapt teaching programmes[5]

Each objective was ranked as follows: 0 (“no or weak support”), 1 (“some support”) and 2 (“strong support”). We assume that they have the same weight in the determination of their average. *Support* is therefore a quasi-continuous variable ranging between 0 and 2. Since we want the predictions of the model to fall between this range, we consider that *support* follows a distribution that is left-censored at 0 and right-censored at 2. The tobit model appears to be the adequate method of estimation given this consideration.

The optimum effort allocated to interactive activities may not coincide with the degree of real interaction, i.e. if exogenous constraints or rationing on individual behaviour arises. It would result in a degree of real interaction below the individual optimum. Consequently, we define another variable as a proxy for the real effort allocated to interactive activities:

- Cooperation: perceived degree of R&D cooperation with firms. We considered three answers, ranked as follows: 0 (“none”), 1 (“some”) and 2 (“much” or “very much”).

Given the qualitative and indexed nature of the response variables for *cooperation* we decided to use an ordered probit for estimating our econometric model.

Table 1 shows descriptive statistics for the dependent variables. If we assume that *support* and *cooperation* are measured in the same, comparable, scale, we may notice that the mean is lower for the second. This may indicate that the optimum level of time allocated to interactive activities is actually higher than the real level.[6]

Table 1. Descriptive statistics of dependent variables

Variable	Mean	Standard deviation	Minimum	Maximum	Number of cases
Support	1.19	0.52	0	2	360
Cooperation	0.75	0.77	0	2	373

Here is the list and description of the explanatory variables:

- w: proxy for faculty member wage. It is the average of the following variables, ranging from 0 to 3:
  - Faculty member age: 0 (less than 30 years), 1 (between 30 and 39 years), 2 (between 40 and 49 years), 3 (more than 49 years).
  - Teaching experience: 0 (less than 5 years), 1 (between 5 and 9 years), 2 (between 10 and 14 years), 3 (more than 14 years).
  - Teaching scale: 01 (associate professor), 1 (assistant professor), 2 (full professor 1), 3 (full professor 2).[7]
  - Number of Spanish six-year term research awards (so-called sexenia): 0 (none), 1 (one), 2 (two), 3 (more than two).
  - Holding a managerial position at the university: 0 (no), 3 (yes).
- Q: proxy for net revenue from a unit of knowledge produced by interactive activities. It is the average of the following variables, regarding the perceived influence of UII on some aspects of academic life. All take values 1 (positive) and 0 (otherwise):
  - Perceived influence of UII on faculty members salary
  - Perceived influence of UII on public resources for R&D projects
  - Perceived influence of UII on scientific career (sexenia)
- δ: proxy for the relative weight given to interactive vs. non-interactive activities in the determination of prestige. It is the average of the following variables, with the same interpretation and range of those included in w:
  - Perceived influence of UII on professional openings for students and collaborators

- Perceived influence of UII on exchange of relevant knowledge
- Perceived influence of UII on freedom of selection of research agenda

❖ A: proxy for knowledge contribution by unit of time allocated to interactive activities. It is the average of the following variables, ranging from 0 to 1:
- Technological content of faculty members' university: 0 (four non-polytechnic universities), 1 (one polytechnic university).
- Technological content of faculty member's discipline: 0 (social sciences and humanities), 0.5 (exact and natural sciences), 1 (engineering and technology).
- Being an associate professor: 0 (no), 1 (yes). The rationale under this variable is that associate professors in Spain are supposed to have previous experience in non-academic domains, e.g. industry. We expect that this will diminish cognitive barriers to interact with industry and then be positively related to knowledge contribution by unit of time allocated to interactive activities.
- Length of research abroad: 0 (0 months), 0.25 (between 0 and 5 months), 0.5 (between 6 and 24 months), 1 (more than 24 months). Here the assumption is that faculty members who do research abroad do so to improve their scientific knowledge. Hence, they will tend to travel to leading scientific countries with more to offer, especially if they are from regions with low absorptive capacity. Some of these leading countries also interact more with industry (e.g. the USA). Therefore, faculty members who do research abroad may learn how to increase knowledge contribution by unit of time allocated to interactive activities.
- Perceived influence of the institutional policy of the respondent's university on cooperation with firms: 1 ("it favours cooperation"), 0 (otherwise).

❖ B: proxy for knowledge contribution by unit of time allocated to non-interactive activities. It is the average of the following variables, ranging from 0 to 3
- Faculty member's university age: 0 (the two youngest universities, less than ten years old), 1 (a twenty years old university), 2 (a thirty-five years old university), 3 (a five hundred years old university).
- Teaching experience: same as defined for w.

❖ e: personal preferences in the utility function. We assume that they may vary according to sex: 0 (male), 1 (female).

Table 2 offers descriptive statistics of the independent variables. Faculty members wage (w) and preferences (e), represented by sex, are the most biased to the left, i.e. most faculty members earn lower wages and are male – actually, 72%. Relative weight given to interactive vs. non-interactive activities in the determination of prestige (δ) is the most skewed to the right variable, i.e. most faculty members think that UII has a positive effect on non-monetary incentives. δ is also the most leptokurtic, reinforcing this impression. Notice that the average is comparable to net revenue from a unit of knowledge produced by interactive activities (Q), and it is a bit higher for δ, which means that faculty members consider that UII has a more positive effect on non-monetary than on monetary incentives. In addition, knowledge contribution by unit of time allocated to non-interactive activities (B) is the second variable most skewed to the right, i.e. most faculty members are in the oldest universities and they have many years of teaching experience. On turn, knowledge contribution by unit of time allocated to interactive activities (A) is the second variable with the highest kurtosis, which means that most faculty members qualify for producing interactive knowledge.

Table 2. Descriptive statistics of independent variables

Variable	Mean	Standard deviation	Skewness	Kurtosis	Minimum	Maximum	Number of cases
w	1.23	0.80	0.33	1.98	0	3	357
Q	0.51	0.31	-0.05	2.10	0	1	380
δ	0.63	0.29	-0.55	2.78	0	1	380
A	0.39	0.20	0.13	2.28	0	0.8	367
B	1.70	0.90	-0.19	1.89	0	3	378
e	0.28	0.45	1.00	2.00	0	1	380

4. Results

We weighted the models using teaching scale, that is the stratification variable as we have shown in the previous section. We present the reduced models that only consider significant variables [8].

Column 1 in Table 3 includes the estimation of our proxy variable for the optimum time allocated to interactive activities, the average support for the objectives of UII. The significance of the σ parameter indicates that there is actually censoring, thus the technique of estimation appears to be adequate. We find that the intensity of the support for the objectives of UII depends negatively on knowledge contribution by unit of time allocated to non-interactive activities. This intensity does not depend on wage [9], income from interactive activities, knowledge contribution by unit of time allocated to interactive activities and parameters of the utility function. Moreover, it depends positively on weight of interactive activities in the determination of prestige. Therefore, significant variables are the most negatively skewed and their sign is the one predicted by the theoretical model.[10]

Column 2 in Table 3 shows the estimation of our proxy variable for real time allocated to interactive activities, the degree of R&D co-operation with firms. The significance of the μ parameter indicates that the dependent variable is actually ordered, thus the technique of estimation is adequate. The frequency of R&D co-operation depends positively on wage, knowledge contribution by unit of time allocated to interactive activities and weight given to interactive activities in the determination of prestige. This frequency does not depend on knowledge contribution by unit of time allocated to non-interactive activities. Frequency of co-operation depends negatively on income from interactive activities and parameters of the utility function. Note that the sign for wage and income from interactive activities is different from the predicted by the theoretical model.

Table 3. Estimation of optimum and real time allocated to interactive activities

	1 Tobit Model - censored (0,2)	2 Ordered Probability Model
Dependent variable	Support	Cooperation
Number of observations	358	340
Log likelihood function	-308.01	-313.71
Prob[χ^2> value] =		0.00
	Coeff.	Coeff.
Constant	0.93 (9.66)	-1.07 (-4.53)
w		0.35 (4.3)
Q		-0.56 (-2.44)
δ	0.7 (6.55)	0.53 (2.07)
A		2.14 (6.15)
B	-0.09 (-2.76)	
e		-0.59 (-3.85)
σ	0.54 (24.11)	
μ		1.11 (12.39)

5. Conclusions

We conclude, first, that a maximising utility model could explain interaction activities and that individual responds to incentives when deciding to allocate efforts among activities.

If it is desirable to promote UII through policy measures, then it is important to discern which are subject to public control and, among them, which have significant effects and what their intensity is. It is remarkable that, according to our results, the relative weight given to interactive vs. non-interactive activities in the determination of prestige, measured through non-monetary incentives, is significant, whereas wage and revenue from a unit of knowledge produced by interactive activities, i.e. monetary incentives, are not. This has one major implication: policies towards non-monetary incentives are more difficult to implement and therefore promoting UII must be seen as a medium-long term target rather than a short-term one.

Although less subject to public control, it is relevant to notice that the effect of knowledge contribution by unit of time allocated to non-interactive activities is significant, whereas it is not the case for interactive activities. This implies that UII is a question of how difficult is to produce non-interactive knowledge rather than how difficult is UII per se.

Our second conclusion is related to the possible existence of rationing, i.e. individual is unable to interact as much as desired since the real amount of interaction may be decided by industry. In this sense, we detect that the intensity of the support for the objectives of interaction and the degree of actual R&D cooperation differ. However, there may be a (non-exclusive) explanation, from the econometric perspective, i.e. a misspecification problem given that industry's decision may affect the results. To disentangle this issue will be subject to further research. It would be interesting because if UII is considered as desirable, policy initiatives might help to eliminate sub-optimal situations arising from rationing.

These conclusions should only apply to regions like the one we have analysed, i.e. with low absorptive capacity.

This can be seen either as a limitation or as an opportunity to study UII from a less common perspective, not focused as usually on high-tech regions.

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Appendix

Table 4 reports marginal effects of the estimations in Table 3 –so-called full effects. For *support*, the scale factor is 0.91, so marginal effects do not make much difference with full effects. On the contrary, for *cooperation* they permit the interpretation of the estimated coefficients as elasticities and clarify the direction of change. This is what we analyse next.

Table 4. Marginal effects of the estimation of optimum and real time allocated to interactive activities

	1 Tobit Model - censored (0,2)	2 Ordered Probability Model		
Dependent variable	Support	Cooperation		
	Coeff.	Cooperation=0	Cooperation=1	Cooperation=2
Constant	0.84	0.00	0.00	0.00
w		-0.14	0.06	0.08
Q		0.22	-0.09	-0.13
δ	0.64	-0.21	0.09	0.13
A		-0.85	0.34	0.51
B	-0.08			
e		0.23	-0.11	-0.12

According to Column 2, marginal effects show that an increase of wage (w) rises the probability of "some cooperation" by 6% and of "much/very much cooperation" by 8%. An increase of relative prestige from interaction (δ) rises the probability of "some cooperation" by 9% and of "much/very much cooperation" by 13%. An increase of efficiency in the production of interactive knowledge (A) rises the probability of "some cooperation" by 34% and of "much/very much cooperation" by 51%. An increase of revenue from interaction (Q) reduces the probability of "some cooperation" by 9% and of "much/very much cooperation" by 13%. An increase of the preference for income instead of prestige (e), which in our model is equivalent to be female, reduces the probability of "some cooperation" by 9% and of "much/very much cooperation" by 14%.

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[1] Finally, we do not consider a principal-agent model as Jensen and Thusby but an individual choice model as Beath et al., since it fits better in the European context, where universities and professors do not have so much bargaining power. In fact, wage levels at public universities are set by law.

[2] We follow Cohen and Levinthal's (1990) definition of absorptive capacity: "a limit to the rate or quantity of scientific or technological information that firm can absorb". To justify the extension of the concept of absorptive capacity from firms to regions, see Niosi and Bellon (2002).

[3] The equivalence between the Spanish original categories and the three categories that we mention is not exact, but it uses more popular terms, it simplifies the exposition at the same time that captures the intuition behind the original categories.

[4] The questionnaire was sent by the research vice-rectorates of each university by electronic mail to the random sample of faculty members. Once filled in, faculty members could return the questionnaire by electronic mail, ordinary mail or fax. After a first stage of spontaneous response, a follow-up team was organised to make telephone contact with faculty members of the sample. This fieldwork took place between 22nd May 2001 and 30th June 2001.

[5] For a separate treatment of each objective, see Azagra et al. (2005).

[6] Another question in the survey provides further evidence: 83% of faculty members would like to increase R&D cooperation with firms.

[7] Some full professors in Spain have time only for teaching activities as a statement in their contract. This is what we call "full professors 1". The rest have also time for research activities. This is what we call "full professors 2".

[8] Marginal effects are shown in the appendix.

[9] We also tried to build an alternative variable for wage, w^e, according to this formula (Pons and Blanco, 2005): $w^e = \exp[6.4738 + 0.0248*(\text{faculty age}) - 0.0003*(\text{faculty age}^2) + 0.0048*(\text{years of teaching experience}) + 0.1504*(\text{teaching scale})]$. It did not change the results.

[10] We also made estimations using ordinary least squares and ordered probit models –in this latter case, taking the integer part of the original variable to transform it into an ordinal one. It did not change the results.